CHI MEI
OPTOELECTRONICS

Approval

TFT LCD Approval Specification

MODEL NO.: M220J1-P01

Approval

- CONTENTS -

Version 2.0

REVISION HISTORY

Version	Date	Section	Description
Ver. 2.0	Apr, 18 '08	-	M220J1-P01 Approval Specifications was first issued.

Approval

1. GENERAL DESCRIPTION

1.1 OVERVIEW

The M220J1-P01 is a 22-inch wide TFT LCD cell with driver ICs and a 30-pins-2ch-LVDS circuit board.

The product supports 1920 x 1200 WUXGA (16:10 wide screen) mode and can display up to 16.7M colors.

The backlight unit is not built in.

1.2 FEATURES

- Super wide viewing angle

- High contrast ratio

- Fast response time

- High color saturation

- WUXGA (1920 x 1200 pixels) resolution

- DE (Data Enable) only mode

- LVDS (Low Voltage Differential Signaling) interface

- RoHS Compliance

1.3 APPLICATION

- TFT LCD Monitor

- TFT LCD TV

- Workstation & desktop monitor

- Display terminals for AV application

1.4 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Diagonal Size	22.0	inch	
Active Area	473.76 (H) x 296.10 (V)	mm	(1)
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1920 x R.G.B. x 1200	pixel	-
Pixel Pitch	0.247 (H) x 0.247 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	16.7M	color	-
Transmissive Mode	Normally White	-	-
Surface Treatment	Hard coating (3H), Anti-glare (Haze 25%)	-	-

1.5 MECHANICAL SPECIFICATIONS

Item	Min.	Typ.	Max.	Unit	Note
Weight	-	-	615	g	-
I/F connector mounting position	The mounting inclination of the connector makes the screen center within ±0.5mm as the horizontal.				(2)

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

(2) Connector mounting position

+/- 0.5mm

Version 2.0

CHI MEI
OPTOELECTRONICS

Approval
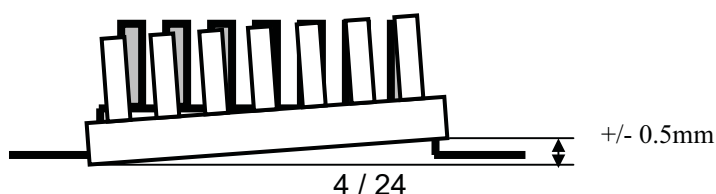
2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT (BASED ON CMO MODULE M220J1-L01)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	+50	ºC	(1), (2)

Version 2.0

2.2 ABSOLUTE RATINGS OF ENVIRONMENT (OPEN CELL)

High temperature or humidity may reduce the performance of panel. Please store LCD panel within the specified storage conditions.

Storage Condition: With packing.

Storage temperature range: 25±5 ºC.

Storage humidity range: 50±10%RH.

Shelf life: 30days

2.3 ELECTRICAL ABSOLUTE RATINGS (OPEN CELL)

Item	Symbol	Value		Unit	Note
		Min	Max		
Power Supply Voltage	V_{CC}	-0.3	+6.0	V	(1)

Note (1) Permanent damage might occur if the module is operated at conditions exceeding the maximum values.

Version 2.0

Approval

3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD OPEN CELL

Ta = 25 ± 2 ℃

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	4.5	5.0	5.5	V	-
Ripple Voltage		V_{RP}	-	--	100	mV	-
Rush Current		I_{RUSH}	-	--	3	A	(2)
Power Supply Current	White	Icc	-	590	710	mA	(3)a
	Black		-	950	1150	mA	(3)b
	Vertical Stripe		-	860	1050	mA	(3)c
LVDS differential input voltage		Vid	200	-	600	mV	
LVDS common input voltage		Vic	--	0.8	--	V	

Note (1) The module is recommended to operate within specification ranges listed above for normal function.

Note (2) Measurement Conditions:

Vcc rising time is 470μs

Version 2.0

CHI MEI
OPTOELECTRONICS

Approval
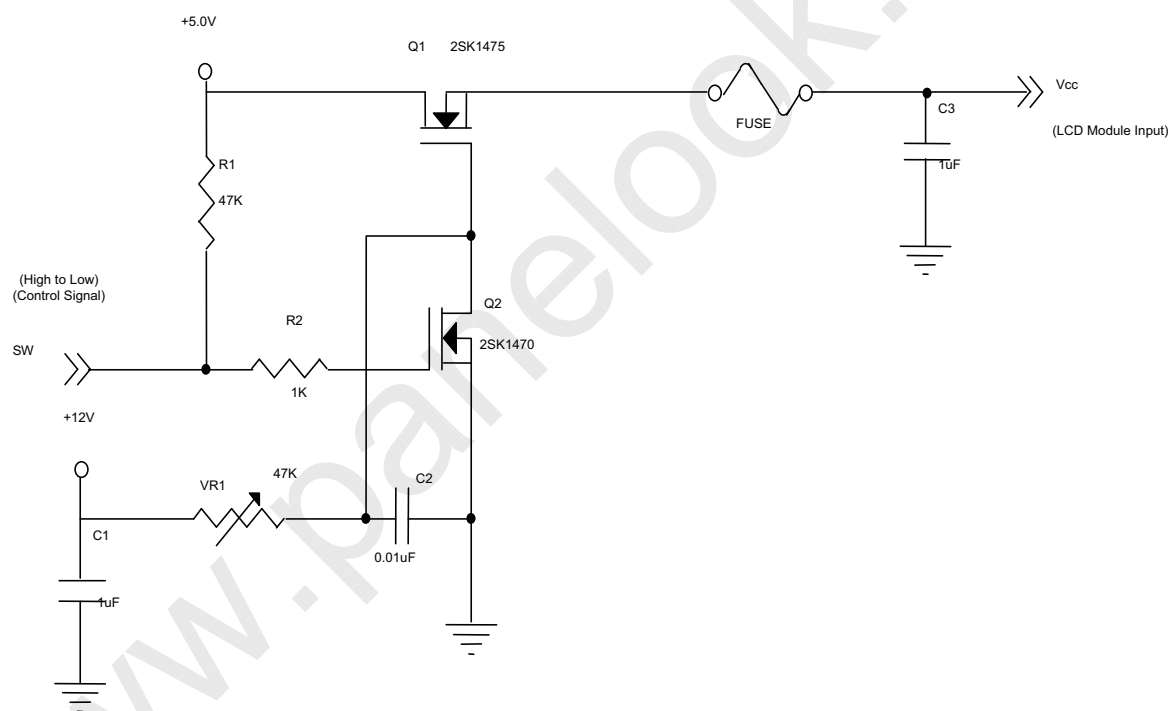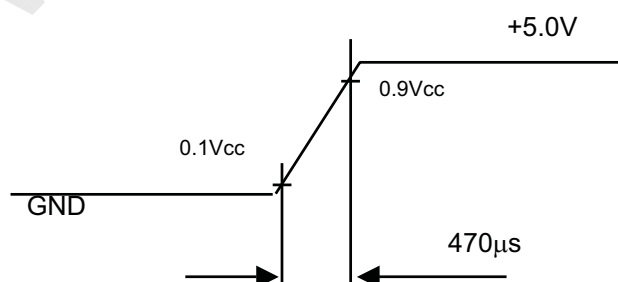
Note (3) The specified power supply current is under the conditions at Vcc = 5.0 V, Ta = 25 ± 2 ºC, f_v = 60

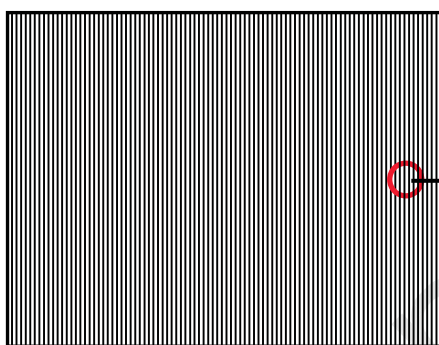Hz, whereas a power dissipation check pattern below is displayed.
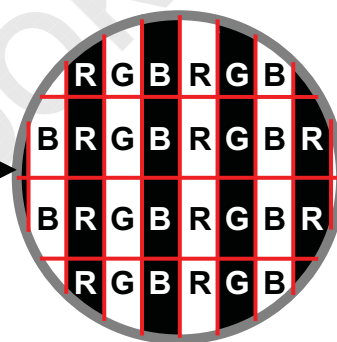
a. White Pattern

b. Black Pattern

Active Area

Active Area

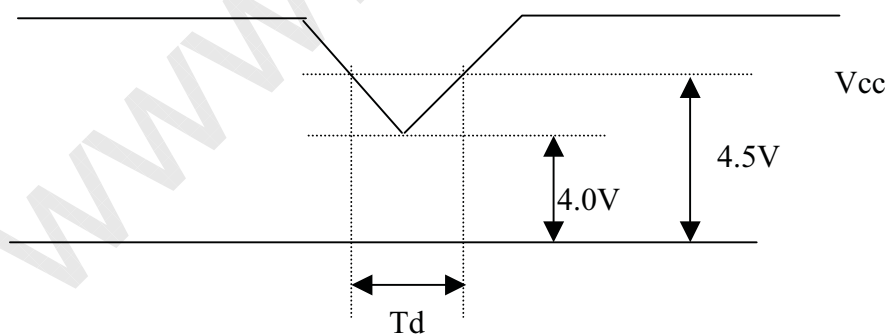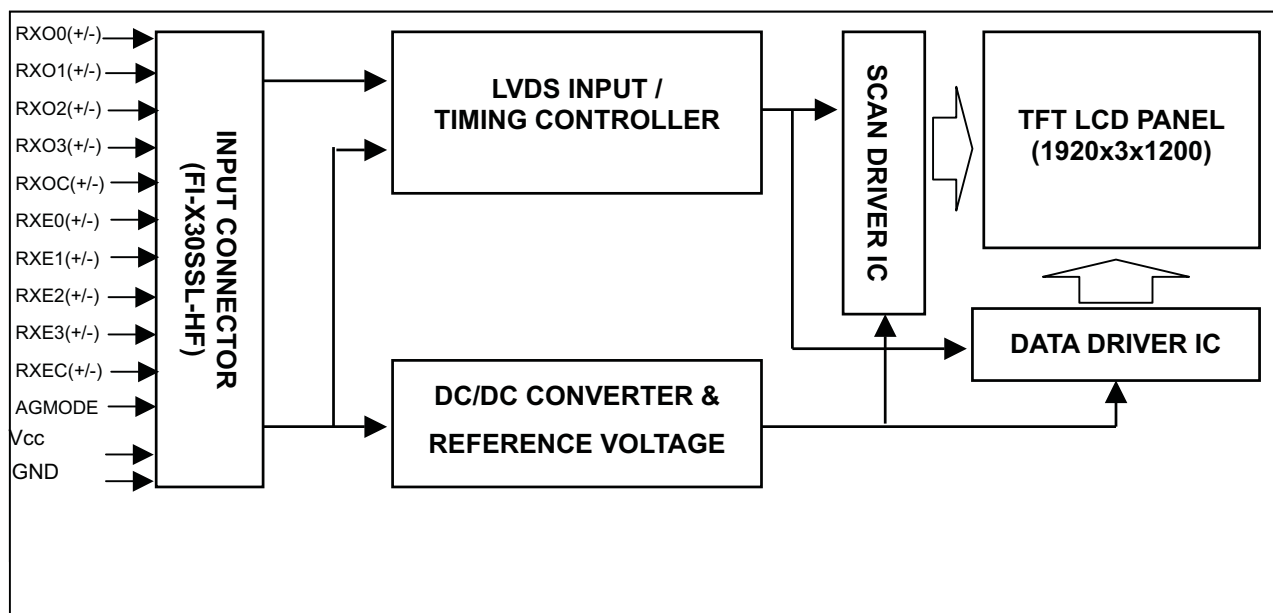c. Vertical Stripe Pattern

Active Area

3.2 Vcc Power Dip Condition:

Vcc

4.5V

4.0V

Td

Dip condition: $4.0V \leq Vcc \leq 4.5V, Td \leq 20ms$

Version 2.0

4. BLOCK DIAGRAM

4.1 TFT LCD OPEN CELL

Version 2.0

CHI MEI
OPTOELECTRONICS

Approval

5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD MODULE

Pin	Name	Description
1	RXO0-	Negative LVDS differential data input. Channel O0 (odd)
2	RXO0+	Positive LVDS differential data input. Channel O0 (odd)
3	RXO1-	Negative LVDS differential data input. Channel O1 (odd)
4	RXO1+	Positive LVDS differential data input. Channel O1 (odd)
5	RXO2-	Negative LVDS differential data input. Channel O2 (odd)
6	RXO2+	Positive LVDS differential data input. Channel O2 (odd)
7	GND	Ground
8	RXOC-	Negative LVDS differential clock input. (odd)
9	RXOC+	Positive LVDS differential clock input. (odd)
10	RXO3-	Negative LVDS differential data input. Channel O3(odd)
11	RXO3+	Positive LVDS differential data input. Channel O3 (odd)
12	RXE0-	Negative LVDS differential data input. Channel E0 (even)
13	RXE0+	Positive LVDS differential data input. Channel E0 (even)
14	GND	Ground
15	RXE1-	Negative LVDS differential data input. Channel E1 (even)
16	RXE1+	Positive LVDS differential data input. Channel E1 (even)
17	GND	Ground
18	RXE2-	Negative LVDS differential data input. Channel E2 (even)
19	RXE2+	Positive LVDS differential data input. Channel E2 (even)
20	RXEC-	Negative LVDS differential clock input. (even)
21	RXEC+	Positive LVDS differential clock input. (even)
22	RXE3-	Negative LVDS differential data input. Channel E3 (even)
23	RXE3+	Positive LVDS differential data input. Channel E3 (even)
24	GND	Ground
25	NC	Not connection, this pin should be open.
26	AGMODE	AGMODE should be tied to ground or open.
27	VCC	+5.0V power supply
28	VCC	+5.0V power supply
29	Vcc	+5.0V power supply
30	Vcc	+5.0V power supply

Note (1) Connector Part No.: 093G30-B0001A(STARCONN) or FI-X30SSL-HF(JAE) or EQUIVALENT.

Note (2) The first pixel is odd.

Note (3) Input signal of even and odd clock should be the same timing.

Version 2.0

CHI MEI
OPTOELECTRONICS

Approval

5.2 LVDS DATA MAPPING TABLE

LVDS Channel O0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	OG0	OR5	OR4	OR3	OR2	OR1	OR0
LVDS Channel O1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	OB1	OB0	OG5	OG4	OG3	OG2	OG1
LVDS Channel O2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	OB5	OB4	OB3	OB2
LVDS Channel O3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	OB7	OB6	OG7	OG6	OR7	OR6
LVDS Channel E0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	EG0	ER5	ER4	ER3	ER2	ER1	ER0
LVDS Channel E1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	EB1	EB0	EG5	EG4	EG3	EG2	EG1
LVDS Channel E2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	EB5	EB4	EB3	EB2
LVDS Channel E3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	EB7	EB6	EG7	EG6	ER7	ER6

Version 2.0

Doc. No.:
Issued Date: Apr. 25, 2008
Model No.: M220J1-P01

Approval

5.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																								
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage
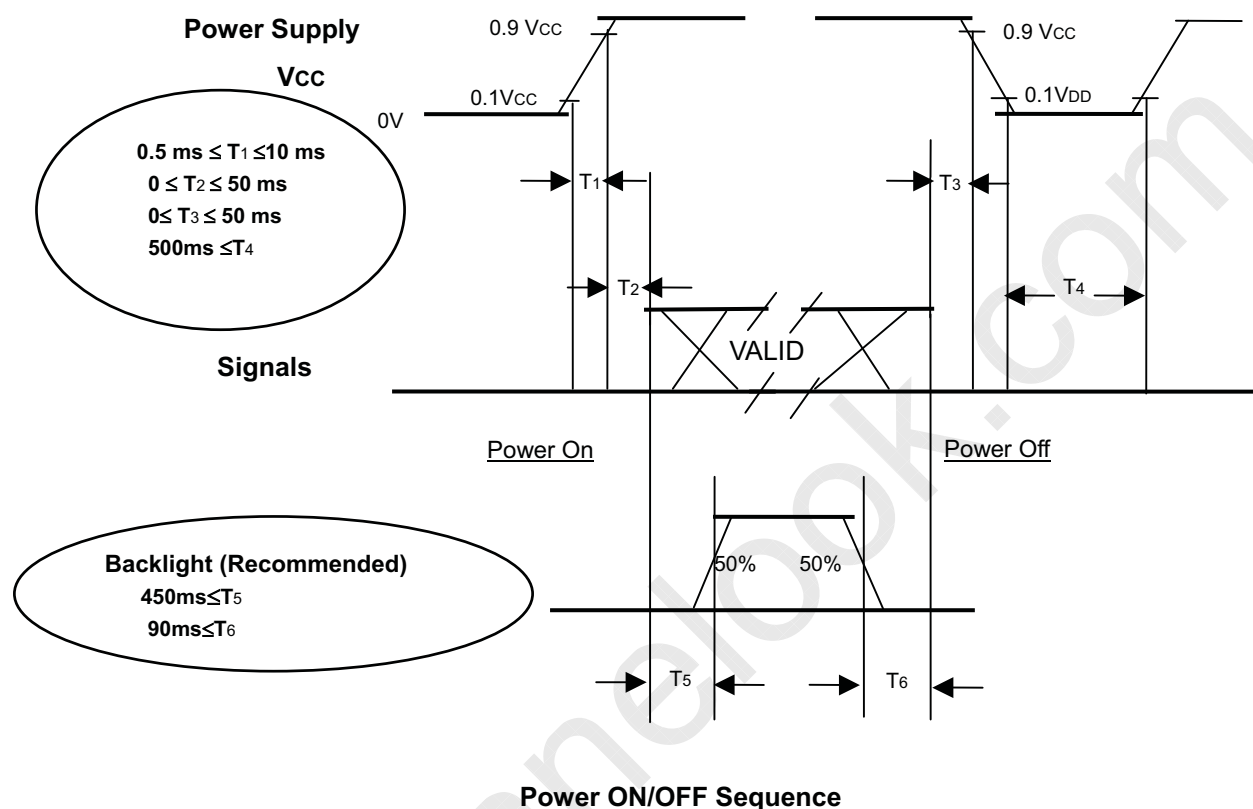
Version 2.0

6. INTERFACE TIMING

6.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Clock	Frequency	Fc	57.6	77	83	MHz	-
	Period	Tc	12.05	13	17.36	ns	
	High Time	Tch	-	4/7	-	Tc	-
	Low Time	Tcl	-	3/7	-	Tc	-
LVDS Data	Setup Time	Tlvs	600	-	-	ps	-
	Hold Time	Tlvh	600	-	-	ps	-
Vertical Active Display Term	Frame Rate	Fr	-	60	-	Hz	Tv=Tvd+Tvb
	Total	Tv	1210	1235	1350	Th	-
	Display	Tvd	1200	1200	1200	Th	-
	Blank	Tvb	Tv-Tvd	35	Tv-Tvd	Th	-
Horizontal Active Display Term	Total	Th	1000	1040	1114	Tc	Th=Thd+Thb
	Display	Thd	960	960	960	Tc	-
	Blank	Thb	Th-Thd	80	Th-Thd	Tc	-

Approval

6.2 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should follow the conditions shown in the following diagram.

Power Supply

Vcc

$0.5\ ms \leq T_1 \leq 10\ ms$
$0 \leq T_2 \leq 50\ ms$
$0 \leq T_3 \leq 50\ ms$
$500ms \leq T_4$

$0.9\ V_{CC}$ $0.9\ V_{CC}$
$0.1V_{CC}$ $0.1V_{DD}$
0V

T_1 T_3

T_2 T_4

VALID

Signals

Power On   Power Off

Backlight (Recommended)
$450ms \leq T_5$
$90ms \leq T_6$

50%   50%

T_5 T_6

Power ON/OFF Sequence

Note.

(1) The supply voltage of the external system for the module input should be the same as the definition of Vcc.

(2) Please apply the lamp voltage within the LCD operation range. When the backlight turns on before the LCD operation of the LCD turns off, the display may, instantly, function abnormally.

(3) In case of VCC = off level, please keep the level of input signals on the low or keep a high impedance.

(4) T4 should be measured after the module has been fully discharged between power on/off periods.

(5) Interface signal shall not be kept at high impedance when the power is on.

Version 2.0

CHI MEI
OPTOELECTRONICS

Approval

7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25 ± 2	^{o}C
Ambient Humidity	Ha	50 ± 10	%RH
Supply Voltage	V_{CC}	5.0	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Inverter Current	I_L	7.0 ± 0.5	mA
Inverter Driving Frequency	F_L	55 ± 5	KHz

7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown as below. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Chromaticity (CIE 1931)	Red	Rcx	$\theta_x=0°$, $\theta_Y=0°$ CS-1000T Standard light source "C"	Typ - 0.03	0.656	Typ + 0.03	-	(0),(6)
		Rcy			0.328		-	
	Green	Gcx			0.276		-	
		Gcy			0.594		-	
	Blue	Bcx			0.147		-	
		Bcy			0.101		-	
	White	Wcx			0.319		-	
		Wcy			0.359		-	
Center Transmittance		T%	$\theta_x=0°$, $\theta_Y=0°$ CS-1000T, CMO BLU	4.7	5.25	---	%	(1), (8)
Contrast Ratio		CR		700	1000	---	-	(1), (3)
Response Time		T_R	$\theta_x=0°$, $\theta_Y=0°$	---	1.3	2.2	ms	(4)
		T_F		---	3.7	5.8	ms	
Transmittance uniformity		δT%	$\theta_x=0°$, $\theta_Y=0°$ USB2000	---	1.3	1.42	-	(1), (7)
Viewing Angle	Horizontal	θ_x+	CR≥10 USB2000	75	85	---	Deg.	(1), (2) (6)
		θ_x-		75	85	---		
	Vertical	θ_Y+		70	80	---		
		θ_Y-		70	80	---		

Version 2.0

CHI MEI
OPTOELECTRONICS

Approval

7.3 Flicker Adjustment

(1) Adjustment Pattern: 2H1V checker pattern as follows.

(2) Adjustment Method:

Flicker should be adjusted by turning the volume for flicker adjustment by the ceramic driver. It is adjusted to the point with least flickering of the whole screen. After making it surely overrun at once, it should be adjusted to the optimum point.

Version 2.0

Approval

Version 2.0

Approval
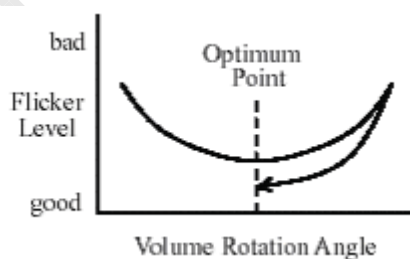
Note (4) Definition of Response Time (T_R, T_F):
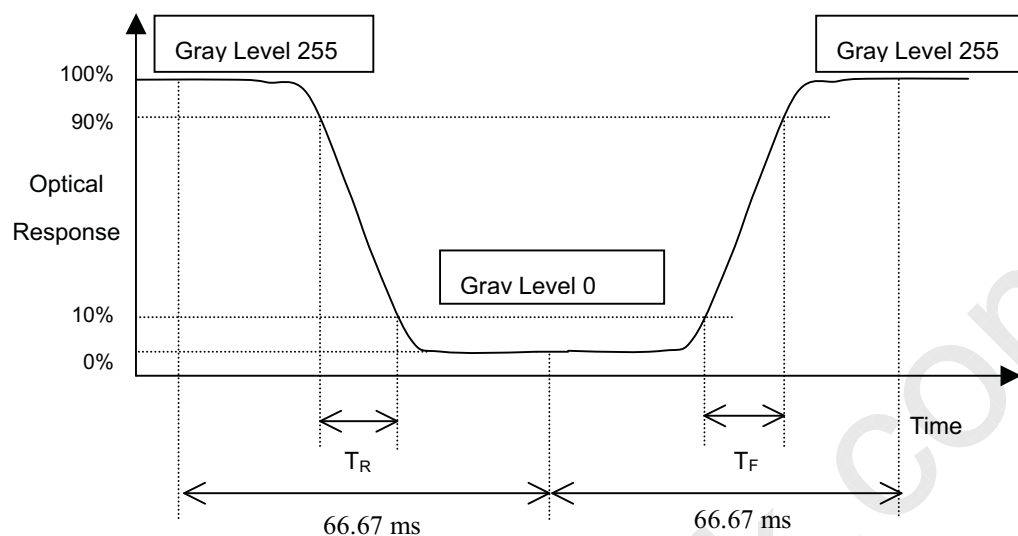

Note (5) Definition of Luminance of White (L_C):

Measure the luminance of gray level 255 at center point

$L_C = L(5)$

$L(x)$ is corresponding to the luminance of the point X at Figure in Note (7).

Note (6) Measurement Setup:

The LCD module should be stabilized at given temperature for 40 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 40 minutes in a windless room.

18 / 24

Version 2.0

Approval
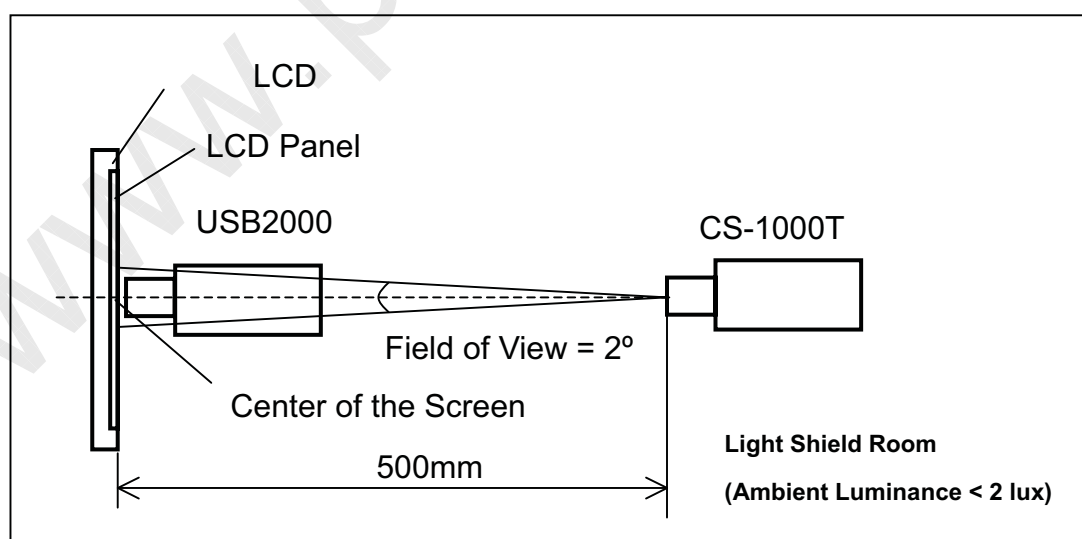
Note (7) Definition of Transmittance Variation (δT%):

Measure the transmittance at 9 points

$$\delta T\% = \frac{\text{Maximum } [L(1), L(2),\ldots\ldots L(12), L(9)]}{\text{Minimum } [L(1), L(2),\ldots\ldots L(12), L(9)]}$$

Note (8) Definition of Transmittance (T%):

Module is without signal input.

$$\text{Luminance of LCD module}$$

Version 2.0

8. PACKAGING

8.1 PACKING SPECIFICATIONS

(1) 13 open cells / 1 Box

(2) Box dimensions: 650 (L) X 550 (W) X 320 (H) mm

(3) Weight: approximately 15.1Kg (13 open cells per box)

8.2 PACKING METHOD

(1) Carton Packing should have no failure in the following reliability test items

Test Item	Test Conditions	Note
Packing Vibration	ISTA STANDARD Random, Frequency Range: 1 – 200 Hz Top & Bottom: 30 minutes (+Z), 10 min (-Z), Right & Left: 10 minutes (X) Back & Forth 10 minutes (Y)	Non Operation

(2) Packing method.
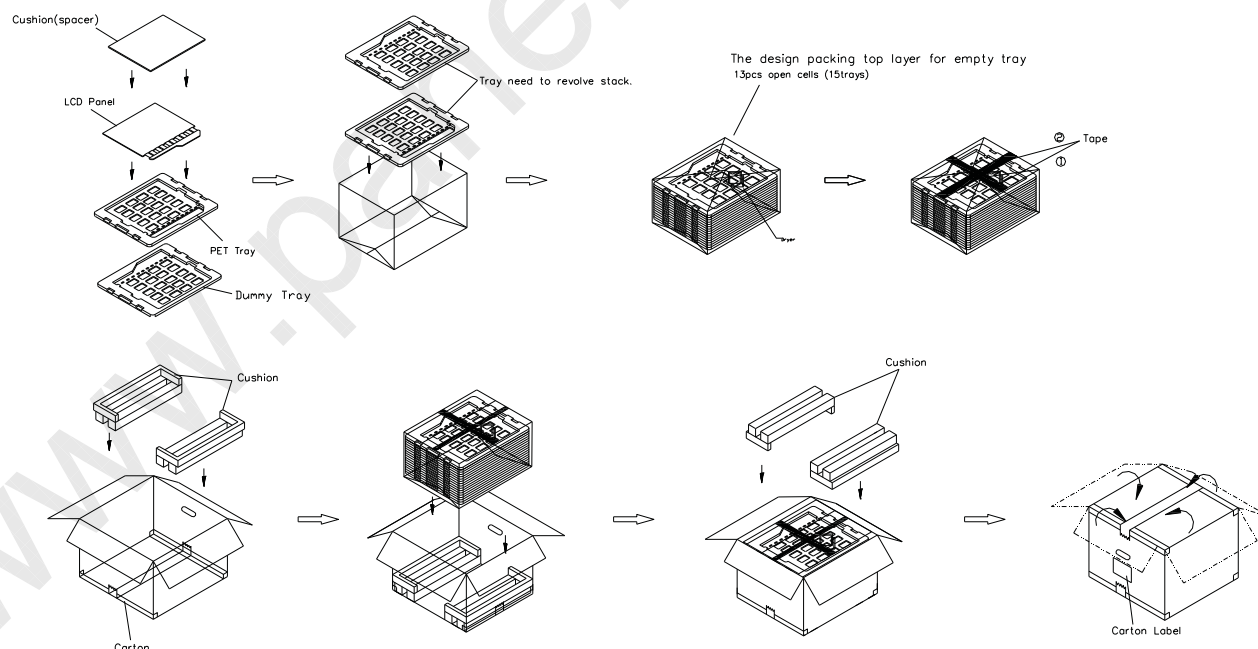
(1) 13 open cells+PCB/1 box
(2) Carton dimensions : 650(L)x550(W)x320(H)mm
(3) Weight : approximately 15.1kg(13 open cells per Carton).

Version 2.0

Sea and Land Transportation
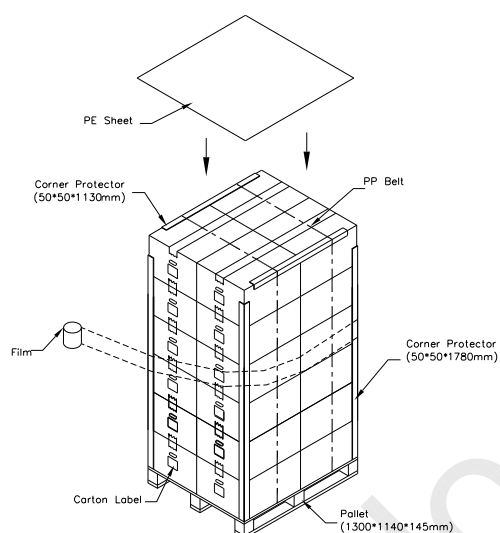
Air Transportation

Version 2.0

Doc. No.:
Issued Date: Apr. 25, 2008
Model No.: M220J1-P01

Approval
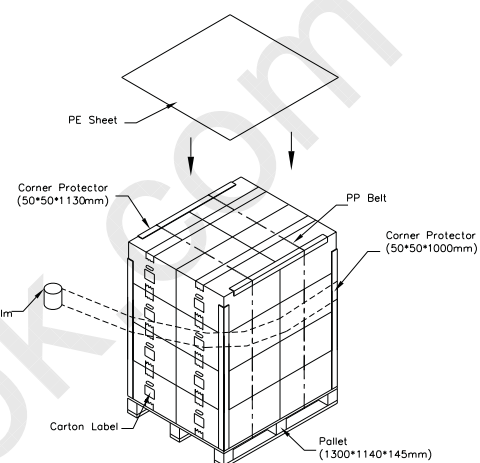
9. DEFINITION OF LABELS

9.1 CMO OPEN CELL LABEL

The barcode nameplate is pasted on each OPEN CELL as illustration for CMO internal control.

M220J1-P01   RoHS   Rev.XX

CM22J11XXXXXLXXLYMDNNNN

Barcode definition:

Serial ID: CM-22J11-X-X-X-XX-L-XX-L-YMD-NNNN

Code	Meaning	Description
CM	Supplier code	CMO=CM
22J11	Model number	M220J1-P01=22J11
X	Revision code	C1:1 ,C2:2……
X	Source driver IC code	Century=1, CLL=2, Demos=3, Epson=4, Fujitsu=5, Himax=6, Hitachi=7, Hynix=8, LDI=9, Matsushita=A, NEC=B, Novatec=C,
X	Gate driver IC code	OKI=D, Philips=E, Renasas=F, Samsung=G, Sanyo=H, Sharp=I, TI=J, Topro=K, Toshiba=L, Windbond=M
XX	Cell location	Tainan, Taiwan=TN
L	Cell line #	0~12=1~C
XX	Module location	Tainan, Taiwan=TN
L	Module line #	0~12=1~C
YMD	Year, month, day	Year: 2001=1, 2002=2, 2003=3, 2004=4… Month: 1~12=1, 2, 3, ~, 9, A, B, C Day: 1~31= 1, 2, 3, ~, 9, A, B, C, ~, T, U, V
NNNN	Serial number	Manufacturing sequence of product

9.2 CARTON LABEL

The barcode nameplate is pasted on each box as illustration, and its definitions are as following explanation

(a) Model Name: M220J1 –P01

(b) Carton ID: CMO internal control

(c) Quantities: 13 pcs

Version 2.0

Approval

10. PRECAUTIONS

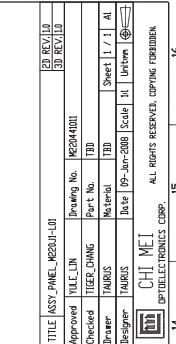### 10.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the product during assembly.

(2) To assemble backlight or install module into user's system can be only in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) It is not permitted to have pressure or impulse on the module because the LCD panel will be damaged.

(4) Always follow the correct power sequence when the product is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.

(5) Do not pull the I/F connector in or out while the module is operating.

(6) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(7) It is dangerous that moisture come into or contacted the product, because moisture may damage the product when it is operating.

(8) High temperature or humidity may reduce the performance of module. Please store this product within the specified storage conditions.

(9) When ambient temperature is lower than 10ºC may reduce the display quality. For example, the response time will become slowly.

10.2 SAFETY PRECAUTIONS

(1) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

(2) After the product's end of life, it is not harmful in case of normal operation and storage.

11. MECHANICAL DRAWING

Version 2.0